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10/021,531	12/12/2001	Khoi A. Phan	G0215	1886

7590

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EXAMINER

TRAN, BINH X

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 08/13/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/021,531

Applicant(s)

PHAN ET AL.

Examiner

Binh X Tran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 31 July 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) 17-25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☒ Claim(s) 13 is/are objected to.
- 8) ☒ Claim(s) 1-25 are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's election without traverse of Group I (claims 1-16) in Paper No. 4 is acknowledged.
2. Claims 17-25 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 4.

### *Claim Objections*

3. Claim 13 is objected to because of the following informalities: In claim 13, the term "form" in the phrase "selects at least one relevant model form the set of etch control models" (emphasis added) appear to be a typo error for --from--. Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
5. Claim 2-4 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 2, the phrase "selected from the group comprising" (emphasis added) is indefinite for improper use of Markush language. The examiner suggests replacing "selected from the group comprising" with --selected from the group consisting of--.

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Claims 3-4 are indefinite because they directly or indirectly depend on claim 2.

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-2, 5-7 are rejected under 35 U.S.C. 102(b) as being anticipated by Kumihashi et al. (US 6,136,721).

Kumihashi discloses an apparatus comprising:

a metal etcher for performing overetching (Fig 8, 13);

a wafer 6 (target device) placed in the metal etcher;

an overetch controller (21) coupled to the metal etcher, to control overetching

and to control removal of an overetch amount of the material from the wafer.

Respect to claim 2, Kumihashi teaches the target device is a wafer having at least one semiconductor device and the metal layer is aluminum (col. 18 line 50 to col. 19 line 21). Respect to claim 5, Kumihashi teaches the etcher is capable of performing metal etching and metal overetching (Fig 9, 12, col. 20 lines 53-55). Respect to claim 6-7, Kumihashi teaches that the overetching controller (21) has the sensor 20 (i.e., photo detector) to measure the feedback data of the target device during overetching and using the feedback data to control the overetching (Fig 8-9, col. 11 line 41 to col. 12 line 8)

***Claim Rejections - 35 USC § 103***

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8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 3-4, 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumihashi in view of Chao et al. (US 5,780,315).

Respect to claims 3-4, Kumihashi fails to disclose the wafer has an oxide layer covering with the remaining residue of aluminum from the metal etch process. In an etching system, Chao discloses that the wafer has an oxide layer (col. 4 lines 65-67). Chao further teaches that the un-removed aluminum residues remain on the wafer after the main aluminum-etching step (col. 5 lines 25-39). Since the oxide layer is on the wafer and the residues are existed after the metal etching step, some portion of the residues must cover the oxide layer. It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Kumihashi in view of Chao by having the oxide layer covering with residue because the oxide layer can be used as the mask during the metal etching step.

Respect to claims 8, Kumihashi fails to disclose a device model to provide overetch parameter to the overetch controller. Chao discloses charted experience (read on "device model") to provide overetch parameter to the overetch controller (Fig 2B, Fig 3, col. 5-6). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Kumihashi in view of Chao by using a model to provide overetch parameter because this would produce optimum etching results without the

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necessity to predetermine the pattern density of the wafer before loading into the wafer.

Respect to claim 9, Chao teaches the controller is capable of controlling the endpoint time of overetch and main etch (read on "overetch time controller", col. 5 lines 8-19).

Chao further teaches the overetch controller comprises a set of charted experiences (read on "set of etch control model") and a control system using a computer.

Respect to claim 10, Chao teaches the controller is capable of determine and detect the endpoint of the overetch process. The limitation of claim 12 has been discussed above under Chao's reference. Respect to claim 13-14, Chao teaches the wafer is identified and selected at least one charted experience data from the set of two dimensional charted data store in the computer (col. 6 lines 24-40). The limitations of claim 16 have been discussed above.

10. Claims 11, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumihashi and Chao as applied to claim 9 above, and further in view of Smith (US 6,322,935).

Respect to claims 15, Kumihashi and Chao do not explicitly teaches the etch control model comprise three-dimensional information. Smith teaches that the etching is control using the three-dimension information (col. 3 lines 50-63, col. 6 lines 52-65). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Kumihashi and Chao in view of Smith by using the 3-D information model because it will provide more accurate etching pattern.

Respect to claim 11, Kumihashi and Chao fail to disclose the model include the layout data, etchable area and percentage of etchable area. Smith teaches to generate

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a 3 dimension etch map for the wafer (Fig 15-16, read on the limitation of "layout data, etchable area"). The three-dimension etch map show the how the depth per dose area. Base on the three-dimension etch map, any person of ordinary skill in the arts would be able to calculate the percentage of etchable area. It would have been obvious to one having ordinary skill in the art, at the time of invention, to generate a control models includes layout data, etchable area and percentage of etchable area because it will provide a greater control during etching.

***Conclusion***

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X Tran whose telephone number is (703) 308-1867. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (703) 305-2667. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Binh X. Tran  
August 6, 2003

**NADINE NORTON**  
**PRIMARY EXAMINER**

